

## A Brief History of Computation's in Portugal

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**ABSTRACT :** A history of the great development of information technology in the twentieth century, at a global level. The story of the emergence and development of information technology in Portugal, also in the twentieth century, is highlighted.

**KEYWORDS :** computers, computer history, Internet, Portugal, software history.

### I. INTRODUCTION

The introduction of information technology in Portugal was late, and it was in the 60s of the twentieth century, but it was not an isolated case in Europe. But in Portugal the difficulties were even greater because it was a poor country, with an average income per capita (in 1950) 38% below the average of the more developed European countries and 22% below the average income in the USA. Portugal was also a country where large companies had no representation. And the scientific community was small. With the 1974 revolution, there was an expansion of the higher education system, universities became an incentive for investment in information technology, but openness to foreign companies also favoured investment in this area. For all this, it is interesting to understand how Portugal, in the 21st century, is one of the most sophisticated European countries in information technology. The beginning of this process is what we are going to address here, in a contextualized perspective with the beginnings of computing.

### II. GENERAL HISTORICAL REVIEW

The entire modern economy of the twentieth century was directly based on a scientific and research infrastructure, based on a set of technological innovations related to the computing sector. The last fifty years of the twentieth century were technologically advanced and based on four major inventions: valves, transistor, integrated circuit, and the microprocessor. All the initial advances in computing were directly related to military projects, mainly in the United States of America. And many of these military projects, in which computer science was developed, arise from war efforts, some of which had begun their journey before World War II had ended. Some even related to the "Manhattan" project that gave rise to the atomic bomb the start-up of the use of computers at company level was in 1955. Remington has produced its first UNIVAC, having sold about forty-six units to one million Dollars each. In 1952, IBM has produced the 701 Defense Calculator, the first digital computer. Ten years later, this company was on top of sales, with regard to computers. Sperry Rand was in second place, but only with a 10% market share. In the late 1940s, IBM has developed some designs for electromechanical calculators, which we can consider as the precursors to our modern PCs. This includes the IBM 704, that at the time was the faster and more sophisticated computer in the market. The development of the FORTRAN programming language arised from the need to implement a system that would allow new functionalities in these first computers. It was implemented in the IBM 704. However, this development only achieves effective results with the IBM 360.

The INM 360 brings new technological advances, replacing the transistors with integrated circuits, which allowed to produce faster and smaller computers. It also brought another breakthrough, the introduction of an 8-bit group-based architecture, which has become an industry standard. [1] In the 1970s there was a huge leap in computer technology and the commercialization of business level computers, especially with the VAX line from Digital. It was intended with this line to obtain machines with multitasking characteristics along with high processing capacities in relation to previous lines. This line was a huge success, leading in 1977 to the integration of Digital into Compaq. At that time, nearly half a million VAX line computers had been sold. [2] After 1975, IBM dominated the computer market, mainly due to the success of the IBM 370 system. This system's performance was multiplied by four and its reliability greatly increased, largely thanks to new CPUs and new integrated circuits. The ferrite memories have been replaced by semiconductor memories. The storage capacity has also been improved. The 8-inch floppy disk drives appeared with this IBM system. That is, shortly before the great general impact of computing in society as a whole, IBM dominated the market. This revolution takes place with the development of a single integrated circuit of all the basic instructions and control functions which allowed to operate a computer. Intel, Texas Instruments and Motorola were at the forefront of this breakthrough.

In 1976, Apple Computer launched its first personal computer, the Apple I, based on a 6502 8-bit MOS Technology microprocessor working at 1 MHz with a keyboard, that could be connected to a conventional TV monitor. In the meantime, Microsoft and Bill Gates had entered into the computer market, with the creation of CP / M operating system for IBM, as well as starting to produce programming languages such as BASIC and FORTLAND, and later the MSDOS. In 1983, Microsoft began producing and selling operating systems to vendors other than IBM. With the growth and development of PCs, Microsoft and Intel had played a leading role in the cutting edge of computing, and especially in microcomputers. The dissemination and use of computers, on a larger scale, from the 80's, has boosted the need to develop technological processes that allowed to connect computers among themselves, that is, in a network. This impetus was initially related to universities and scientific research institutions. Novel has perceived this technology's potential and created NetWare, which was the first operating system for local area networks (LAN), with full cross-platform features. This first Novel system was based on a machine that managed the entire network and controlled access to users as well as to peripheral devices. [3] The emerging needs to new computers with high graphics and numerical processing capabilities led Apollo Computer and Sun Microsystems to develop and market the first workstation-based computers based on the UNIX operating system. This system has been developed by Bell Laboratories, initially an open and modular system with large portability capabilities. In 1985, IBM and Microsoft have signed an agreement to develop a new operating system called OS / 2. It was intended for a new type of computers and would replace IBM computers using MSDOS operating system. At the same time, Microsoft was developing Windows 1.0, which featured a graphical interface. In the early 1990s, Microsoft has released Windows 3.0 and 3.1 operating systems consecutively, with the particularity of making use of 32-bit processors.

After the 1990s, Windows operating system began to be the standard in micro-computing, mainly since the release of Windows 95 (1995), followed by Windows 98 (1998), Windows ME (2000), Windows 2000 (2000) and Windows XP (2001); at this point, the commercial domain of Microsoft operating systems was colossal, almost becoming a default standard. On the 90's, a confluence between communications and information technology began to be seen. Microsoft was one of the first to see this potential and created Windows CE for PDA which later evolved into Pocket PC system and Windows Mobile, fully integrating communications and computer processing functionalities. Finally, the gigantic leap in computing comes with the proliferation of Internet masses. The origin of the Internet came with ARPA (Advanced Research Project Agency) reporting directly to the North American Government that, in association with Stanford University and UCLA of Utah, began a special connection in network of several stations, with military purposes. By the late 1970s, ARPANET was widespread by almost all North American Universities. It has been mainly used for e-mail and online discussions. In 1977, a new step is taken in the technological advancement, which later allowed for a greater spread of the Internet, ARPA defined TCP / IP as a single communication protocol (small note: it is not actually a protocol, but rather two main protocols, IP and TCP, and a few more associated with it). This protocol would become the standard for all Internet communication. Since the 1980s, Internet is no longer managed by military administrations and is now run by civilian entities, one of the first is NSF (National Science Foundation);

ARPANET itself will be managed by this institution. From the 1990s onwards, Internet is generally used as an information vehicle and as a linking structure for several previously isolated networks. [4] Cisco Systems pioneered the creation of technological solutions for data transfer between networks and computers, starting with hardware solutions and then software. It was the first company to create a Router based on TCP / IP. The emergence of the Word Wide Web and the creation of the browser triggered the investigation and production of increasingly sophisticated software solutions for contents sharing and visualization, which led to a huge proliferation of the Internet use, mainly of WWW and the email. It should be noted that the first web browser has been pioneered developed by the National Center for Supercomputing Applications of the University of Illinois and became known as MOSAIC. The version released in 1993 allowed hypertext on the WWW. In 1994, this browser became known by the name of Netscape. And it makes a start of the real mass use of Internet.

### **III. COMPUTING IN PORTUGAL**

As incredible as it may seem to my readers, it can be said that the beginnings of computing in Portugal were already in 1900. The Directorate-General for Statistics, predecessor of the National Statistics Institute, has used a tabulating machine for the treatment of population census data in 1900. It was a mechanical device, called March counter. And this is the first reference, in Portugal, to an equipment of this kind and for information processing purposes. This machine was powered by levers for counting operations and a pedal for printing results. Sixty keys were used for inputting data from census reports, and the results were printed on a tape. This type of technology also had other applications, namely, in "Companhias Reunidas de Gás e Electricidade" (Gas and Electricity Gathered Companies), around 1938, in customer billing and management applications.

At the same time, the Portuguese Army makes use of a similar system, around 1960, in Mechanographical Services, based on tabulating machines, dividers, intercalators and drillers. Truly having computers, in Portugal, in the true meaning of the term, it was the National Laboratory of Civil Engineering, in the sixties. The first computers of this institution were analogical. In that same decade, some economic groups, such as CUF and some banks, have equipped themselves with similar equipments. [5] LNEC, in the 1960s, was equipped with IBM 604; this equipment had the peculiarity of having electronic calculator capabilities. This equipment was later replaced by a Stantec Zebra computer, still working on valves, but with higher calculation capabilities. Around 1963, LNEC acquires the first digital computer in Portugal, the Elliot 803B. This computer differed from the former ones by something substantial, it run on transistors instead of the classic valves. This computer was later replaced by another of the same brand, the Elliot 4130, which had a 24-bit 24-bit core memory, also had a tape punch, and its mass memory consisted of three units of magnetic tape. The construction project of "Aguieira" dam extensively required the use of this equipment. There have been some private companies who have requested LNEC's services only to make use of this equipment, namely the "Hydrotechnical Portuguesa", which used this computer to solve a system of 34 equations and 34 unknowns. [6] In the early 1960s, Galenian Foundation acquired an Elliot 4100 computer, and shortly thereafter an IBM 1620, which had ferrite memory. All these machines programming was done in FORTRAN.

The Technical Higher Institute (IST) has only acquired its first computers in the seventies, the first was an IBM 360/44, this computer was equipped with a memory of 128k, which was quite a lot for the time, providing it a high computational capacity. IST has made extensive use of this equipment, namely in teaching support, but also in all the management work of the institute itself. In the sixties, the National Statistical Institute (INE) acquires a UNIVAC 1004, and will only acquire more sophisticated equipment's in the seventies, such as UNIVAC 9400, with an 87.5Mb disk. In this decade, it acquires another UNIVAC 1100/11 series, with 512K of central memory and a 4Gb disk, this computer was connected to 24 terminals in an internal network and to 13 external terminals, that were connected to it by remote process. In the eighties, these equipment's have been replaced by Unisys 2200/400, which was, in fact, a mainframe, centralizing all the Institute's data. [7] After the period of democracy restoration in Portugal (1974), computing has penetrated all social and business areas. At that time, mainframe-based systems were being replaced by computers with higher processing capacities, although smaller in size and easier maintenance. The eighties have been characterized by historical names in computing, such as Apple, Commodore, Atari and Apricot computers. In that decade, in Portugal, these brands, did not have a great implementation, with the exception of the Sinclair ZX81 as well as the famous Spectrum. The development of micro-computing in Portugal and its domestic use, with no doubt, was due to the Spectrum. This equipment had a Zilog Z80-A processor working at 3.50 MHz, with 16kg of ROM, and had two versions in Portugal, one with 16Kb of RAM and another with 48kb of RAM. [8]

The easy use of this equipment and its low cost have made it famous in Portugal. In technical terms, there are two more things that have made it easier to succeed, the software was distributed on audio cassettes, the only mass memory they had, and the ease of BASIC programming. It was also at this time that thousands of individuals sought training in the BASIC. Landry was who introduced this equipment in Portugal, and which gave way to Solbi. This expansion of micro computing, in Portugal, from the Spectrum, has been consolidated by the appearance and introduction in the national market of the Amstrad CPC464. [9] Since the 1990s, the expansion of microcomputers has happened in parallel both in the business world and in the domestic one. With the entry of Microsoft, by operating systems in personal computers, this massification has spread until the year 2000. [10] After the year 2000, there is a widespread use of home microcomputers in Portugal, directly driven by Internet's generalization. Currently, Portugal has the same level of use of domestic microcomputers as all the countries in the European Union.

#### **IV. CONCLUSION**

The period from the 1960s to 1974 was a period of intense growth of the Portuguese economy where the penetration of information technology, mainly in the business world, occurred. The banking sector with its modernization also contributes to the expansion of information technology in Portugal. Emphasis is given to the important roles of Regisconta, Teledata and IBM. The restructuring of public services since 1977 also encouraged investment in "new technologies". The dissemination of small personal computers, from the 80's, and the first game consoles, were the engine for the expansion of information technology in Portugal. When the advent of the Internet took place the country was already aware of the potential of personal computers, which accelerated the expansion in sales of this equipment and its software. We can say that Portugal started very late in the use of computers but recovered all this delay in the 90's of the twentieth century.

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